

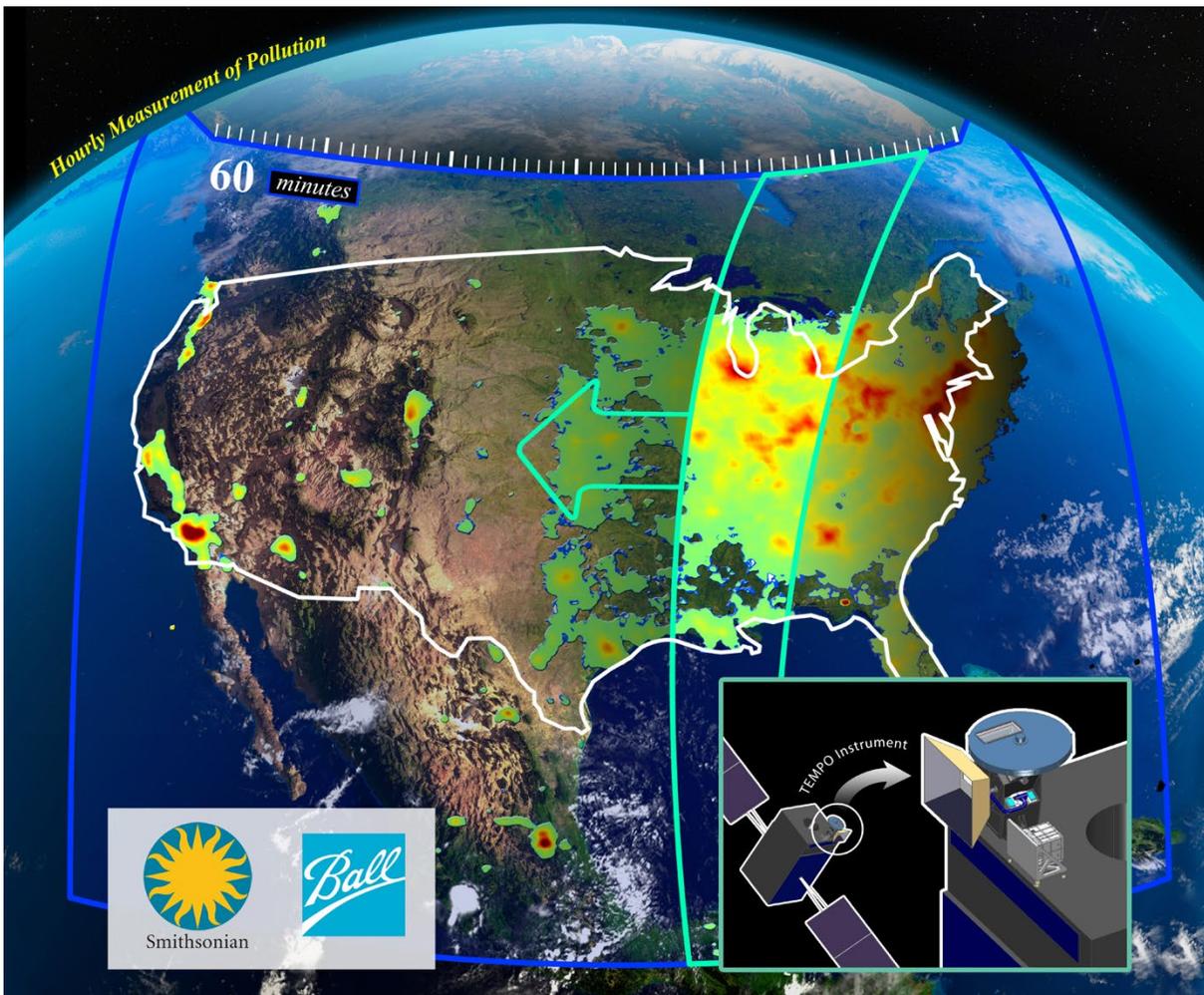


Science

NASA Langley Research Center Flight Projects Directorate Office Tropospheric Emissions: Monitoring of Pollution (TEMPO)

What's in the air we breathe? The Tropospheric Emissions: Monitoring Pollution, or TEMPO, mission aims to answer this question with more detail and precision than ever before, by creating a new dataset of atmospheric chemistry measurements from space. TEMPO will be the first space-based instrument to monitor major air pollutants across the North American continent every daylight hour at high spatial resolution.

The Smithsonian Astrophysical Observatory (SAO)/NASA partnership will measure North American air pollution from geostationary orbit. The instrument measures ultraviolet, visible and near-infrared spectra to determine key pollutants. Hourly measurements will be made of the U.S., Canada, Mexico, Cuba, and The Bahamas at high spatial resolution. TEMPO will be part of a global air quality constellation, along with European and



TEMPO provides space-based measurements to help solve national and international challenges as air quality standards continue to change and new pollution sources are evolving.

Asian instruments aimed at helping to improve air quality and health.

The instrument will be delivered to a commercial host and will hitch a ride on a commercial satellite to a geostationary orbit about 22,000 miles above Earth's equator. This vantage point will enable TEMPO to monitor daily variations in ozone, nitrogen dioxide, and other key elements of air pollution from the Atlantic to the Pacific, and from Mexico City and the Yucatan Peninsula to the Canadian oil sands. The instrument will resolve pollution levels to regions of several square miles—far better than existing limits of about 100 square miles.

TEMPO is the first funded project of NASA's Earth Venture Instrument program, which includes small, targeted science investigations designed to complement NASA's larger research missions. It is part of the agency's Earth System Science Pathfinder program. It consists of the Instrument Project, competitively selected by NASA from the SAO proposal, and the Mission Project, directed to NASA's Langley Research Center. TEMPO's new stream of data will enable researchers to improve pollution emission inventories, monitor population exposure, and evaluate effective emission-control strategies. It will also provide near-real-time air quality products that will be made publicly available, and will help improve air quality forecasting.



Artist's illustration of TEMPO satellite host

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Building on experience with instrument and mission development in previous missions, TEMPO is launching during a timeframe when two other pollution-monitoring satellites from Europe (Sentinel 4) and Asia (GEMS) will also be in operation. The three instruments together will form a global constellation for air quality monitoring, including a major focus on intercontinental pollution transport across the Atlantic and Pacific oceans.

The TEMPO instrument is a grating spectrometer, sensitive to visible and ultraviolet wavelengths of light, which will be attached to the Earth-facing side of a commercial telecommunications satellite in geostationary orbit. This allows TEMPO to maintain a constant view of North America so that the instrument's light-collecting mirror can make a complete East to West scan every hour of the day. By measuring sunlight reflected and scattered from the Earth's surface and atmosphere back to the instrument's detectors, TEMPO's light sensors will provide spectra of ozone, nitrogen dioxide, and other elements of daily atmospheric chemistry cycles. TEMPO's dataset showing daily and hourly variations in the concentrations of these pollutants will enable researchers, air quality managers, policy makers, and public citizens to better monitor the changing "chemical weather" locally, regionally, and across the continent.

The TEMPO science team is a collaboration of scientists from multiple U.S. and international organizations with extensive experience in measuring components of air quality from space. The team includes members from the SAO, Ball Aerospace & Technologies Corporation, NASA's Langley Research Center and Goddard Space Flight Center, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the National Center for Atmospheric Research, Harvard University, the University of California at Berkeley, St. Louis University, the University of Alabama Huntsville, the University of Nebraska, RT Solutions, Carr Astronautics and international partners from Korea, Europe, Canada, and Mexico.

The Flight Projects Directorate (FPD) at NASA's Langley Research Center successfully completes flight projects from concept definition through launch. FPD drives new business, develops strong teams through effective partnerships, and improves processes and procedures. FPD projects support the Aeronautics, Space Technology, Science, and Human Exploration Mission Directorates.

For more information about FPD, please visit <http://fpd.larc.nasa.gov/>

For more information about TEMPO, please visit <http://tempo.si.edu/>

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